

tuberculosis but whose tuberculin skin test remains negative and whose sputum fails to show acid-fast bacilli on repeated examinations. A diagnosis of melioidosis depends on the identification of *Pseudomonas pseudomallei* in tissue fluids such as blood, sputum, pleural fluid, or pus or a positive serologic test of the organism. Pulmonary paragonimiasis, often referred to as endemic hemoptysis, can be diagnosed by showing ova in the sputum, stool, pleural fluid, or bronchoalveolar lavage fluid. Occasionally a transbronchial biopsy may reveal an adult fluke. A complement fixation test and other serologic studies, including immunoelectrophoresis, indirect hemagglutination test, indirect fluorescent antibody test with immunoglobulin (Ig) G, and IgG enzyme immunoassay, are useful.

Amebiasis, usually considered a disease of the tropics, is transmitted from person to person by the fecal-oral route. It now exists in every country of the world and should be considered in the differential diagnosis of any unexplained lower lobe pulmonary consolidation or pleural effusion. The response to treatment with metronidazole is so dramatic that it can be considered diagnostic. The presence of *Entamoeba histolytica*, either in the sputum, pleural aspirate, or aspirate from a hepatic abscess, establishes the diagnosis. Amebic gel diffusion, counterimmunoelectrophoresis, and indirect hemagglutination are accurate and extremely useful tests in nonendemic areas. Bowel infestation with *E. histolytica* is common in endemic areas, and the organism may coexist with many other diseases. Similarly, the failure to detect *E. histolytica* in a stool specimen does not exclude pleuropulmonary amebiasis.

Tropical pulmonary eosinophilia is seen mainly in India, Pakistan, Bangladesh, Southeast Asia, and the South Pacific islands. The clinical features of cough, fever, weight loss, night sweats, and diffuse miliary or nodular pulmonary infiltration are often confused with those of miliary tuberculosis, hypersensitivity pneumonitis, and sarcoidosis. In tropical eosinophilia, however, serum eosinophil counts and IgE levels are exceedingly high. The response to the administration of diethylcarbamazine citrate is dramatic and diagnostic.

Malaria and hydatid disease also affect the lungs. Clinical pulmonary disease develops in about 10% of patients with *Plasmodium falciparum* infection. Pulmonary edema and the adult respiratory distress syndrome are the two most serious, potentially lethal, complications. Diagnosis is made by examining a Giemsa- or Wright's-stained smear of peripheral blood. Hydatid disease in endemic areas is often included in the differential diagnosis of a localized nodular or a mass lesion in the lung. Occasionally a chest x-ray film may show multiple densities. A crescent or "water lily" sign, considered diagnostic, is caused by an air leak between the two membranes encircling the opacity; computed tomography and thoracic ultrasonography studies are helpful. A hydatid-specific, IgE enzyme-linked immunosorbent assay, immunofluorescent antibody, and indirect hemagglutination test increase chances of detecting pulmonary hydatid disease.

Other tropical diseases that involve the lungs include typhoid and paratyphoid infections, schistosomiasis, sickle cell disease, and hantaviral infections. Every physician needs to have a good knowledge of tropical pulmonary medicine to remain on guard when an unexplained lung or pleural lesion strikes an immigrant or a traveler returning from the tropics.

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Evaluating Patients With Chest Pain

CHEST PAIN is a common symptom in patients seen in emergency departments and in inpatient and outpatient settings. The primary concern of both clinician and patient is to exclude a cardiac origin, possibly the most life-threatening. The mainstay of chest pain evaluation after a careful, focused history is not the electrocardiogram (ECG), but the noninvasive stress test.

An understanding of Bayes' theorem is essential to the rational, cost-effective use and accurate interpretation of noninvasive stress testing in the diagnosis of coronary artery disease. According to Bayes' theorem, the positive and negative predictive values of a test are determined not only by test specificity and sensitivity, but also by the prevalence of the disease in patients similar to those under consideration. In estimating the probability of coronary artery disease in a given patient, a clinician uses features of clinical history—including the presence or absence of the standard risk factors for the disease—and physical examination. The sensitivity and specificity of treadmill exercise testing, the most common form of stress testing, are determined by several factors, including the ECG definition of an abnormal (positive) test result, achieved double product (systolic blood pressure times heart rate), and metabolic equivalent units (METs) or resting oxygen intake (usually 3.5 ml of oxygen per kg per minute), duration of exercise, and underlying ECG abnormalities that might preclude a meaningful interpretation of exercise tracings. Exercise scintigraphy, echocardiography, and radionuclide angiography are useful in overcoming the difficulty that baseline ECG abnormalities impose on interpreters. Stress scintigraphy or echocardiography using pharmacologic agents such as dobutamine or dipyridamole are particularly useful in patients unable to achieve a reasonable double product with dynamic exercise or who cannot exercise because of musculoskeletal problems, amputation, or limiting claudication.

In patients with typical angina pectoris in whom the probability of coronary artery disease is high, the exercise

test provides only modest incremental value in establishing the diagnosis; it can, however, provide important prognostic information based on the non-ECG variables of exercise duration and METs achieved, as well as data that may indicate the need for coronary arteriography. Whereas establishing a diagnosis of coronary artery disease requires the achievement of an adequate heart rate, evaluating the effect on myocardial ischemia of a particular antianginal regimen need not, and the patient may exercise while taking all relevant medications.

Determining the diagnosis in a patient with chest pain atypical for ischemia can be a challenge. The probability of coronary disease in these patients ranges from 10% to 70%, affecting both the positive and negative predictive value of the exercise test result. The sensitivity and specificity assume a more important role; more stringent criteria to define an abnormal test result become necessary for meaningful interpretation. Here, too, high achieved heart rate and high-level and long exercise duration indicate a benign prognosis, whatever the exercise ECG shows. Further evaluation need not be undertaken, although close follow-up is recommended.

If patients achieve greater than 85% of their age-predicted maximum heart rate, yet cannot perform prolonged exercise and have evidence of ischemia, exercise scintigraphy or echocardiography is recommended to assess the volume and areas of myocardium at ischemic risk. If a notable perfusion defect or a wall-motion abnormality is noted, consideration should be given to coronary arteriography. If a substantial perfusion defect or wall-motion abnormality is not found, close follow-up and periodic treadmill tests are recommended. If patients have evidence of ischemia and do not achieve 85% of maximum predicted heart rate or cannot perform prolonged exercise, coronary arteriography is generally indicated. Pharmacologic

stress scintigraphy or echocardiography is used if baseline ECG abnormalities or limited exercise capacity precludes the use of standard treadmill testing.

Because of the perception that women have a high "false-positive" rate on standard treadmill exercise testing, using coronary angiography as the gold standard, routine stress scintigraphy has been advocated in female patients. Our practice is to do the less costly, standard exercise test first. If an ischemic test shows no abnormality, the patient is reassured of the absence of important myocardial ischemia, and no further workup is undertaken. If an ischemic test results, the patient is considered to have angina and is appropriately treated. Should coronary arteriography be done and the angiogram results are normal, the diagnosis of microvascular angina (syndrome X) should be strongly considered and the patient treated with appropriate antianginal medication. A normal coronary angiogram does not exclude the diagnosis of myocardial ischemia.

Patients with chest pain in whom both exercise ECG and scintigraphic results are normal have a benign prognosis despite the continuation of their chest pain. Reassurance in these cases is appropriate, and treatment is continued for the chest pain, if necessary.

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